WQB "Wide Aperture Quad" for Main Injector

8 September 2005, 9:00 AM
IB2 conference room

Attendees: Bruce Brown, Weiren Chou, Hank Glass, Dave Harding, Jim Jablonski, Dave Johnson, Ioanis Kourbanis, Bill Robotham, John Zweibohmer

Measurements

Hank and Dave H. showed integrated strength measurements on WQB001-1 from 0 to 4000 A compared to the average of the IQB measurements. As expected, the WQB saturates at lower current and more enthusiastically. There is a significant at difference low currents, where the WQB remanent field is important. At intermediate currents the fractional difference between the two is constant. At high currents the difference increases again as the WQB saturates. As-built, WQB is 3.0% stronger at injection (~200 A), 0.6% stronger at 120 GeV (~2800 A), and 1.4% weaker at 150 GeV (~3600 A). Those numbers can be raised or lowered together by increasing or decreasing the length of the poles. That is essentially the only adjustment to the strength possible.

Dave J. showed a calculation of the effect on beta around the ring of having the WQB quads 2.5% different from the IQB quads. The typical beta wave amplitude was ±20%. This is unacceptable at either injection or extraction. At Bruce's suggestion, Dave J. agreed to look at the effect on the lattice of the difference in saturation of the IQC's and IQD's compared to the IQB's.

Leon Bartleson's electrical measurements of the trim coils did not clarify the trim coil inductance puzzle. The initial measurement showed the trim coil inductances at about half the expected value while the main coils were about as expected. The mutual inductance of the two coils is not as expected. Magnetic measurements of the magnet powered by the trim coils will shed light on whether the coils are wired properly. Some obscure database issue has stalled those measurements, but Hank is working on the problem.

From here the measurement plan will include

1. Measure the excitation and harmonics using the trim coil at currents from 0 to 28 A in 4 A steps and with the main coil off.
2. Off-center harmonics left and right up the ramp.
3. SSW scans *approximately* at injection, 120 GeV, 150 GeV, and some intermediate current. Per the TDH, the nominal current for 150 GeV is 3630 A, 120 GeV is 2900 A, and injection is 215 A. We take 1000 A as our intermediate point current. Precise currents will be chosen to match currents at which full harmonics are measured.

Design

Lucy Nobrega has proclaimed the beam tube cleaning process to be sufficient, but requests closer consultation in the future.

In WQB004 there are urethane pads at several locations between the pole tips and the beam tube to hold the tube in place. Before the magnet is welded up we will do a trial pump-down and see whether the tube moves. This is the same material that was used to take up dimensional variation in the Main Injector dipole coils. For the magnet already assembled, the plan is to pump down the tube and insert a G-10 shim between pole and tube at the ends.

Fabrication

WQB001 is at MTF.

WQB002 is being retrofitted with the water-cooled bus.

WQB003 is being manifolded with the water-cooled bus.

WQB004 is being assembled, with all four quarters in the fixture with the beam tube.

WQB005 has all four coils wound and wrapped. Two coils are potted. All trim coils are wound and all cores are stacked.

WQB006 has two main coils wound.

WQB007 has not been started

Schedule

Although the shut-down has slipped, we will continue to push forward but ease off of the overtime.

Next meeting will be 15 September 2005 at 9:00 in the Industrial Building 2 conference room.